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Industrial Applications of Limestone Deposits of Kohat, NWFP: A Research Towards the Sustainability of the Deposits

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(received October 28, 2006; revised July 31, 2007; accepted August 3, 2007)

Abstract. Chemical analyses, petrographic studies and physical tests of limestone deposits in the vicinity of Kohat along Bannu Road, Hangu Road and Rawalpindi Road were carried out to categorize these reserves, locality-wise, for their specified industrial uses. Limestone of Kohat area was found to be generally good for construction purposes. The deposits on the Hangu Road were of good quality with more than 97% $CaCO_3$ and suitable for use in chemical, iron and steel industries, for glass making, soda ash manufacture etc. The deposit of Bannu Road with 96.5% $CaCO_3$ can be used for sugar refining, paint industry, flue gas desulphurization, animal feed etc. The limestone deposit of Rawalpindi Road is inferior in quality having 95.2 % $CaCO_3$. It can be utilized in rubber industry, as ceramic whiting, building materials, rock wool etc.

Keywords: limestone, Kohat (NWFP), industrial applications, sustainable development

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Delignification of Pakar Wood (*Ficus lacon* Buch) by Organosolv Pulping with Aliphatic Organic Acids

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(received March 16, 2007; revised October 2, 2007; accepted October 8, 2007)

Abstract. Pakar wood (*Ficus lacon* Buch) of particle size 0.315-1.00 mm was subjected to organosolv delignification with acetic, formic and propionic acids. Optimum delignification was achieved with 95, 80 and 70% of these acids, respectively, with optimum catalyst (HCl) concentration of 0.25, 0.20 and 0.15%, the time being180, 120 and 120 min, respectively.

Keywords: organosolv pulping, pakar wood, delignification, aliphatic acids

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Regeneration of Spent Chromium Solutions

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Abstract. Regeneration of spent Cr^{+6} solutions using lead dioxide anodes was investigated. Pure and Cu^{+2} doped lead dioxide electrodes were prepared by electrodeposition of lead dioxide on carbon-based substrates using Pb^{+2} nitrate bath at 1.5-1.75 V, pH 4-4.5, temperature 60-70 °C and current density 0.0125-0.0175 A/cm^2. Electrolyses of prepared Cr^{+3} solutions, both in divided and undivided cells, were used to investigate the electrocatalytic activity, adhesion and stability of lead dioxide electrodes, which can serve as industrial electrodes. UV-visible spectrophotometry was used for estimating conversion of Cr^{+3} to Cr^{+6}. The electrocatalytic activity of lead dioxide was increased by doping of Cu^{+2} ions.

Keywords. regeneration, chromium^{+6}, lead dioxide electrode

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Proximate Analysis and Fatty Acid Composition of *Nigella sativa* (Kalonji) Seed Oil Growing in Pakistan

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Abstract. Physical and chemical characteristics including fatty acid composition of samples of seven commercially available *Nigella sativa* oil and three freshly extracted seed oil, collected from different localities, were determined by gas liquid chromatography. The average and standard deviations found were: refractive index at 20 °C, 1.473 ± 0.0018; specific gravity at 20 °C, 0.9166 ± 0.0002; iodine value (IV, Wij's), 119.98 ± 1.8; saponification value, 201.80 ± 2.2 and unsaponifiable matter, 0.61% ± 0.05. Fatty acid (FA) profile was based on high levels of unsaturated FA like oleic acid, 24.17% ± 0.61; linoleic acid, 53.64% ± 0.799 and eicosadienoic acid, 2.3% ± 0.37. Saturated FA such as palmitic acid and stearic acid amounted to 14.82% ± 0.49 and 2.95% ± 0.37, respectively. Myristic and palmitoleic acids were also detected in minor quantity.

Keywords: *Nigella sativa* oil, oleic acid, linoleic acid, eicosadienoic acid, fatty acid composition

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Comparison of Physical Properties of Different Varieties of Cotton

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(received October 17, 2006; revised October 12, 2007; accepted October 15, 2007)

Abstract. Nineteen varieties of cotton of different countries of origin were subjected to tests for determination of physical properties of fibre viz., length (mm), length uniformity (%), short fibre index (SFI %), strength (g/tex), elongation (%), fineness (Micronaire value), reflectance (Rd value) and yellowness (+b value), using the Uster HVI system. Egypt (Giza 70), Egypt (Giza 88), India (MCU 5), USA (Elpaso), Egypt (Giza 86), Sudan (Barkat) and CIS (Sultop) had better overall fibre length, strength and length uniformity %, and low SFI %. Pearson correlation of these physical properties was also determined. A strong positive correlation was found among fibre length, strength and length uniformity while all three of these properties exhibited a strong negative correlation with SFI %.

Keywords: cotton fibre, physical properties, cotton varieties

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Level of Organochlorine Pesticides and Polychlorinated Biphenyls in Shellfisheries and Flounder Eggs at Virginia Beach Using Matrix Solid Phase Dispersion

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Abstract. Concentrations of polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs) including ΣDDTs, Σchlordanes, ΣBHCs, dieldrin, heptachlor epoxide etc were measured in the tissues of different shell fishes and flounder eggs of River James at Virginia Coast, USA. PCBs were the most predominant contaminants, followed by Σchlordanes, ΣBHCs, ΣDDTs, and other OCPs. Concentration of OCPs decreased by an order of magnitude during the last decades in this region; nevertheless, the concentration of PCBs and OCPs in shell fishes are still elevated. Concentrations of organochlorines were highly correlated with one another, and were in the range of a few to several ng/g on a wet weight basis. In the tissue of shell fishes, the sum of ΣOCPs ranged from 193.5-665.53 ng/g, predominated by Σchlordanes. ΣPCB had an overall range of 287.7-28207.9 ng/g and were predominated by ΣAroclor 1248.

Keywords: endocrine disrupting chemicals; organochlorine pesticides; polychlorinated biphenyls; shellfishes; flounder eggs

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Leaf Cuticle Variations in *Amaranthus spinosus* as Indicators of Environmental Pollution

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Abstract. Investigation of the leaf epidermal characteristics of *Amaranthus spinosus* from polluted and non-polluted populations revealed that the stomatal pores of the leaves of the plants of the polluted areas were closed whereas those of the non-polluted areas were open. Mean lenght x mean width of stomatal pores on the upper leaf surface were 0.86 µm x 0.43 µm and 1.23 µm x 0.45 µm on the lower leaf surface of the non polluted microhabitats. Also, the leaves of the polluted population were smaller than those of the non-polluted population. The average leaf area of the plants of the polluted population was 7.64 cm^2 as against 12.13 cm^2 of the plants of the non-polluted areas. The results were attributed to the combined effects of air pollutant that predominated roadsides from where the samples were taken. Thus, it is inferred that this plant could serve as bio-indicator of air pollution.

Keywords: *Amaranthus spinosus*, stomatal pores, air pollution

Biological Sciences

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Mutagenic Effect of Crude Oil on Accessions of *Glycine max* L. (Merril)

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(received May 11, 2006; revised July 28, 2007; accepted August 17, 2007)

Abstract. Study of the effects of crude oil on four accessions of *Glycine max* showed that the rate of germination, root length development and rate of cell division of the accessions decreased with increasing concentration of crude oil. However, the extent of effects on the accessions varied showing differences in the abilities of the accessions to survive in crude oil polluted sites, the tolerance being in the order of TGX1019-1E < TGX1805-31F < TGX1440-1E < TGX1448-2E suggesting TGX 1019-1E to be the best indicator of and TGX1448-2E to be the best tolerant accession to the crude oil pollution.

Keywords: *Glycine max*, mitotic index, pollution, crude oil pollution, mutagenic effect of crude oil

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Partial Replacement of Soybean Cake with *Amaranthus spinosus* Leaf Meal in the Diet of Nile Tilapia (*Oreochromis niloticus*)

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(received January 25, 2007; revised August 1, 2007; accepted August 4, 2007)

Abstract. The study, designed to assess the potentials of oven dried *Amaranthus spinosus* leaf meal as partial replacement for soybean cake in the diet of Nile Tilapia, revealed no significant difference ($P>0.05$) in feed and protein intake. Fish fed on *Amaranthus spinosus* leaf meal diets had significant ($P<0.05$) higher survival percentage, while that on soybean cake meal (control diet) recorded significant ($P<0.05$) better weight gain, average daily rate of growth, efficient feed and protein utilization as well as average final weight.

Keywords: *Amaranthus spinosus* leaf meal, soybean cake, Nile tilapia, feed efficiency ratio, protein efficiency ratio

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Effect of Different Auxins on the Establishment of Damask Rose Cuttings in Different Media

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Abstract. Effect of indole-3-acetic acid and naphthalene acetic acid treatments on the establishment of damask rose (*Rosa damascena* Mill.) cuttings in different growth media was evaluated and it was revealed that the average number of roots and rooting percentage gradually increased with increase in hormone concentration. The maximum number of roots (15.72), rooting percentage (94.17 %), plant height (134.2 cm), plant spread (46.3 cm), primary shoots (6.3), secondary shoots (25) and survival percentage (94.72%) was recorded for 50 mg/l naphthalene acetic acid application; the results were superior to indole-3-acetic acid, the optimum level being in the range of 50 and 75 mg/l. No such conclusion could be drawn for indole-3-acetic acid. The leaf mold was the best growth medium giving the maximum number of roots per cutting (10.78), rooting percentage (87.68%), plant height (125.1 cm), plant spread (37 cm), primary shoots (5.2), secondary shoots (19.48) and survival percentage (85.67%), followed by soil + leaf mold, while soil medium was the least effective.

Keywords: Damask rose, *Rosa damascena* Mill., auxins; indole-3-acetic acid; naphthalene acetic acid; hormones

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Assessment of Pest and Pesticide Trends in Vegetable Crops in the United Arab Emirates and Sultanate of Oman

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Abstract. A preliminary survey on pesticide uses in 40 vegetable-growing farms representing different agricultural areas in Oman and the UAE, twenty farms from each country, revealed that all the vegetable farms used pesticides for crop protection. Among the major insect-pests, whiteflies (*Bemisia tabaci*), leafminers (*Liriomyza trifolii*), melon fruit flies (*Bactrocera ciliatus*), aphids (*Aphis* spp.) and tobacco leafworm (*Spodoptera litteralis*) were recorded in Omani farms. In the UAE, whiteflies, leafminers, cutworms (*Agrotis ypsilan*), tomato fruitworms (*Helicoverpa armigera*) and eggplant fruitworms (*Leucinodes orbonalis*) were the 5 top insect-pests. Among the plant diseases, powdery mildew (*Erysiphe* spp.), blight (*Alternaria* spp.), damping off *(Pythium* spp.*)*, leafspot (*Alternaria* spp.) and mosaic (CMV) were major cause of vegetable diseases in Omani farms; whereas, damping off *(Pythium aphanidermatum)*, downy mildew (*Pseudoperonspora cubensis*), early blight (*Alternaria solani*), septoria leaf spot (*Septoria lycopersici*) and anthracnose rip rot (*Colletotrichum* spp.) were the most predominant diseases encountered in most UAE farms. Among the most commonly used pesticides, 29 insecticides, 16 fungicides and 3 herbicides were used by the vegetable farmers. Around 55% of Omani farms used routine application of pesticides, irrespective of the pest presence. Whereas, in the UAE, most farmers started to spray pesticides at 6-20% pest (insect, disease & weeds) infestation. Over 65% of the farms, in both the countries, received chemical pest management information from the sales representatives.

Keywords: insecticides, fungicides, herbicides, insect-pests, pesticide resistance, pesticide residues, Oman, UAE

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Short Communication

Effect of Plant Growth Regulators on Production of Vindoline in the Callus of *Catharanthus roseus*

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(received January 3l, 2006; revised October 4, 2007; accepted October 10, 2007)

Abstract. Callus of *Catharanthus roseus* cultured from leaf explant was proliferated on MS medium supplemented with different plant growth regulators either individually or in combination. One month old callus was used for extraction and quantification of vindoline in the callus. The highest amount of vindoline (34.49 µg/g) was found in the callus sub-cultured on MS medium supplemented with 6-benzyl-amino purine (BA, 5 mg/l) while 26.82 µg/g vindoline was observed in callus produced on BA and Kinetin (Kin) at 1.0 mg/l of each in combination. The callus produced at different concentration of auxins failed to produce singly detectable concentration of vindoline. It is concluded that cytokinins supplemented in MS medium enhance the production of vindoline in the callus of *Catharanthus roseus*.

Keywords: *Catharanthus roseus*, callus, vindoline, kinetin, auxins